[0104] b) Furthermore, the new selection procedure at the MME is introduced, namely that in a first step, only the C-Plane (SGW-C or PGW-C) is selected, as described above.

[0105] c) After the SGW-C (SGC) and PGW-C (PGC) had been selected in the first step, the selection of U-Plane entities is performed in a second step, and is preferably performed by the e.g. OFC (but could also be the SGW-C or the PGW-C part). According to the present embodiment, this selection is a DNS based solution like in the TS 29.303, i.e., as described above in connection with the selection of the C-Plane.

[0106] That is, once the new SGW-C and PGW-C have been selected, the C plane applications apply for the OFC (OF Controller, OpenFlow Controller) for the allocation of the User plane entities by taking into account the eNB Identity of the UE in question. According to the present embodiment, the SGW-C application connected to the OFC signals the eNB ID area to the OFC. Depending on this and preferably also on the to be accompanied APN/Services the second stage OFC DNS procedure is suggested to allocate the corresponding SGW-U (User plane NE (load balancing, service depending, etc)).

[0107] It is noted that the eNB ID relates to the geographical area of the eNB.

[0108] The C plane applications apply for the OF Controller for the allocation of the User plane entities by taking into account the eNB Identity and the APN of the UE bearer in question. As such the SGW-C application connected to the OFC (OpenFlow Controller) is suggested to signal the eNB ID to the OFC. Depending on this and preferably also on the to be accompanied APN/Services the second stage OFC DNS procedure is suggested to allocate the corresponding User plane NE (load balancing, service depending, etc).

[0109] Thus, the SGW-C part would either be responsible for the allocation of the plain TEID or the SGW-U itself may allocate the TEID instead, whereas the SGW-U procedure for requesting the particular User part network element (for instance defined by the IP

[0110] Address) is performed by the OFC. The TEID allocated by the SGW-C and the IP address allocated by the OFC form the FTEID (fully qualified TEID).

[0111] Then, after successful allocation of the FTEID of the SGW-U, the IDs are forwarded from the SGW-C to the PGW-C via the GTP-C Create Session request. Again the PGW-C may or may not select the TEID for the PGW-U and hands down the APN to the OFC, which may selects the IP address of the PGW-U. Furthermore, the FTEID of the SGW-U are handed down to the OFC of the PGW-C, which in turn can again select the U-Plane of the PGW based on the APN/Service and the FTEID of the SGW-U.

[0112] A simple architecture and a sequence flow are shown in FIG. 1. In particular, different network elements (virtual and legacy) and their connections are indicated by solid lines whereas the sequence flow is indicated by dotted lines.

[0113] In particular, reference sign 1 denotes an MME. Reference signs 21 to 24 denote SGW-C, i.e., control planes of SGWs or resources which can be operated as SGW-C. Reference signs 25 and 26 denote PGW-C, i.e., control planes of PGWs, or resources which can be operated as PGW-C. The elements 21 to 26 may be provided by a virtual network operator (VNO).

[0114] Reference numerals 31 to 33 indicate OFCs, i.e., open flow controllers. These elements may be provided by a virtual network provider (VNP).

[0115] Reference numeral 41 denotes a SGW-U, and reference numeral 42 denotes a PGW-U.

[0116] Reference numerals 51 to 53 describe DNS, which, according to an alternative embodiment described below, may also be PCEs.

[0117] In the following, the signaling flow is described. First, the MME 1 accesses a DNS in S1 in order to obtain information regarding the SGW-C and the PGW-C to be selected. As mentioned above, on this occasion the MME 1 checks whether the SGW is virtualized, i.e., whether the SGW has separated control and user planes, as it is shown in the example in FIG. 1. In this example, the MME receives the address of SGW-C 23 and sends a message in S2 to the SGW-C, by using GTP-C, for example (tunnel protocol for the control plane).

[0118] In response to S2, the SGW-C 23 forwards a message to the OFC 32 in S3 (containing the eNB ID and the APN), so that the OFC 32 will select a corresponding SGW-U. This is effected by accessing a DNS in S4. Thus, the OFC sends a message to the selected SGW-U (SGW-U 41) in S5, and receives a response in S6. As described above, a tunnel is (twill be) established by using the FTEID of the SGW-U. Here, the FTEID is an example for the identity of the SGW-U, i.e., the SGW-U ID. This is acknowledged by sending a message from the OFC 32 to the SGW-C in S7.

[0119] In S8, the IDs are forwarded from the SGW-C 23 to the PGW-C 25. The PGW-C 25 was selected by the MME in S1. The FTEID of the SGW-U 23 is forwarded to the OFC of the PGW-C 25, namely to OFC 33 in S9. The OFC 33 then selects the PGW-U by referring to a DNS, as indicated by S10. Finally, the OFC 33 sends a message to the selected PGW-U.

[0120] In this way, the control and user planes of the elements involved (SGW and PGW) can be selected independently based on the required service and the location of the eNB (because of an implicit correlation between ID and location).

[0121] Furthermore, according to the present embodiment, the so-called northbound interface is enhanced with eNB Identity (already signalled in the ULI of GTP-C, see TS 29274) and the APN. The northbound interface is the interface between SGW-C and OFC. That is, in the example shown in FIG. 1, the message S3 contains the eNB identity and APN.

[0122] Hence, according to the embodiment described above, the interface (in this example based on OpenFlow) between SGW-C and OFC are enhanced with the eNB ID or the ID of the SGW-U. Moreover, the interface to DNS is either enhanced with the indication that the address of xGW-U is requested (like in the above example if done by the OFC) or that the xGW-C ID is requested by the OFC in case the existing DNS mechanism is misused to allocate the xGW-U ID (different to the above example) by the MME.

[0123] That is, that there is an (open Northbound (NB) interface between the Application (xGW-C and the (so called) OFC and which is able to carry at least the APN and the eNB ID (or something similar) on one hand side if the OFC has to determine the SGW-U or on the other side the NB (Northbound) is able to carry the IDs of the xGW-U if already determined by the MME. This especially means in the latter case, that these xGW-U IDs need to be signaled